

What is claimed is:

1 *cl 14* 1. A mobile station transmitting data to and receiving data from an  
2 external base station at high speed, the mobile station comprising:

3 a mobile station communication controller for processing data including  
4 control data to output a predetermined data frame;

5 a mobile station source coder for receiving the data frame and performing  
6 source coding on it according to a predetermined coding method to output coded  
7 data;

8 a first modulator for receiving a first carrier having a predetermined frequency  
9 and modulating the coded signal from the mobile source coder using the first carrier  
10 to generate a first modulated signal;

11 a second modulator for receiving a second carrier having a predetermined  
12 frequency and performing modulation on the first modulated signal using the second  
13 carrier to generate a modulated uplink signal;

14 a mobile station interfacer for transmitting the modulated uplink signal to the  
15 base station and receiving a modulated downlink signal from the base station;

16 a first demodulator for receiving and demodulating the modulated downlink  
17 signal received from the base station via the mobile station interfacer and outputting  
18 demodulated data; and

19 a mobile station source decoder for performing source decoding on the  
20 demodulated data from the first demodulator to convert the demodulated data to a  
21 baseband signal.

1 2. The mobile station of claim 1, wherein the mobile station source coder  
2 performs coding according to a Manchester coding method, and the mobile station  
3 source decoder performs decoding according to a Manchester decoding method.

1 3. The mobile station of claim 1, wherein the second carrier is provided  
2 from the base station.

1 4. The mobile station of claim 1, wherein the first modulator performs  
2 differential phase shift keying (DPSK) modulation, the second modulator performs

3 amplitude shift keying (ASK) modulation, and the first demodulator performs ASK  
4 demodulation.

1 5. A base station transmitting data to and receiving data from an external  
2 mobile station at high speed, the base station comprising:

3 a base station communication controller for processing data including control  
4 data to output a predetermined data frame;

5 a base station interfacer for receiving a modulated uplink signal from the  
6 mobile station and transmitting a modulated downlink signal to the mobile station;

7 a mixer for mixing the modulated uplink signal with a predetermined  
8 intermediate frequency and filtering the mixed signal to convert the modulated uplink  
9 signal to a signal having the predetermined intermediate frequency;

10 an oscillator for generating the predetermined intermediate frequency;

11 a base station demodulator for demodulating the output signal of the mixer to  
12 generate a baseband signal according to a predetermined demodulation method;

13 a base station source decoder for receiving the baseband signal from the  
14 base station demodulator and performing source decoding according to a  
15 predetermined method;

16 a base station source coder for performing source coding the data frame  
17 output from the base station communication controller; and

18 a base station modulator for modulating the output data of the base station  
19 source coder according to a predetermined method and outputting modulated data  
20 to the base station interfacer.

1 6. The base station of claim 5, wherein the base station modulator  
2 outputs a modulated signal for a predetermined time and then outputs only a carrier  
3 having a predetermined frequency until a response is received from the mobile  
4 station.

1 7. The base station of claim 5, wherein the base station demodulator  
2 performs differential phase shift keying demodulation, and the base station  
3 modulator performs amplitude shift keying modulation.

1 8. The base station of claim 5, wherein the base station source decoder  
2 performs decoding according to a Manchester decoding method, and the base  
3 station source coder performs coding according to a Manchester coding method.

1 9. The base station of claim 5, wherein the base station demodulator  
2 comprises:

3 an amplitude limiting amplifier for receiving the output signal of the mixer and  
4 removing noise, thereby outputting a reliable signal;

5 a phase shifter for shifting the output signal of the amplitude limiting amplifier  
6 by a predetermined phase;

7 a quadrature detection receiver for receiving the output signal of the  
8 amplitude limiting amplifier and the output signal of the phase shifter, comparing the  
9 two signals to calculate the phase difference between them and filtering a signal  
10 corresponding to the calculated phase difference to output the variation of voltage;  
11 and

12 an amplitude comparator for comparing the output signal of the quadrature  
13 detection receiver with a predetermined reference value.

1 10. A data communication method of a mobile station transmitting data to  
2 and receiving data from an external base station at high speed, the data  
3 communication method comprising the steps of:

4 processing data including control data to form a predetermined mobile station  
5 information data frame;

6 coding the mobile station information data frame according to a  
7 predetermined source coding method and performing primary modulation on the  
8 coded data frame using a predetermined first carrier according to a first  
9 predetermined modulation/demodulation method;

10 performing secondary modulation on the primarily modulated signal using a  
11 predetermined second carrier according to a second predetermined  
12 modulation/demodulation method and transmitting the secondarily modulated signal  
13 to the base station;

14 demodulating a modulated downlink signal transmitted from the base station  
15 according to the second predetermined modulation/demodulation method and  
16 generating the demodulated signal as a source coded signal; and  
17 decoding the source coded signal according to a predetermined source  
18 decoding method to reconstruct original data.

1 11. The data communication method of claim 10, wherein the step of  
2 performing the secondary modulation comprises the step of performing modulation  
3 based on the second carrier received from the base station.

1 12. A data communication method of a base station transmitting data to  
2 and receiving data from an external mobile station at high speed, the data  
3 communication method comprising the steps of:

4 receiving a modulated uplink signal transmitted from the mobile station to the  
5 base station, mixing the modulated uplink signal with a predetermined intermediate  
6 frequency and filtering the mixed signal to generate an intermediate signal having  
7 the predetermined intermediate frequency;

8 demodulating the intermediate signal according to a predetermined  
9 demodulation method to generate a baseband signal;

10 source-decoding the baseband signal according to a predetermined method  
11 to reconstruct original data received from the mobile station;

12 processing data including control data to form a data frame and source-  
13 coding the data frame; and

14 modulating the source coded data frame according to a predetermined  
15 method and transmitting the modulated signal to the mobile station.

1 13. The data communication method of claim 12, wherein in the  
2 modulating step, the modulated signal is output for a predetermined time, and then  
3 only a carrier having a predetermined frequency is output until there is a response  
4 from the mobile station.

1           14.    An electronic toll collecting system for collecting a toll, the electronic  
2 toll collecting system comprising a mobile station and a base station, wherein a  
3 variety of data including a toll is transmitted and received between the mobile  
4 station and the base station at high speed,

5           the mobile station comprising:

6           a mobile station communication controller for processing control data and  
7 information including start place information and balance to form and output a  
8 mobile station information data frame, receiving base station information data  
9 including destination information and billing information from the base station, and  
10 recalculating and updating the balance;

11          a mobile station source coder for receiving the mobile station information  
12 data frame and performing source coding on it according to a predetermined coding  
13 method to output coded data;

14          a first modulator for receiving a first carrier having a predetermined frequency  
15 and modulating the coded signal from the mobile source coder using the first carrier  
16 to generate a first modulated signal;

17          a second modulator for receiving a second carrier having a predetermined  
18 frequency and performing modulation on the first modulated signal using the second  
19 carrier to generate a modulated uplink signal;

20          a mobile station interfacer for transmitting the modulated uplink signal to the  
21 base station and receiving a modulated downlink signal from the base station;

22          a first demodulator for receiving and demodulating the modulated downlink  
23 signal received from the base station via the mobile station interfacer and outputting  
24 demodulated data; and

25          a mobile station source decoder for performing source decoding on the  
26 demodulated data from the first demodulator to generate a baseband signal and  
27 transmitting the baseband signal to a base station communication controller,

28          the base station comprising:

29          a base station interfacer for receiving a modulated uplink signal from the  
30 mobile station and transmitting a modulated downlink signal to the mobile station;

31 a mixer for mixing the modulated uplink signal with a predetermined  
32 intermediate frequency and filtering the mixed signal to generate a signal having the  
33 predetermined intermediate frequency;  
34 an oscillator for generating the predetermined intermediate frequency;  
35 a base station demodulator for demodulating the output signal of the mixer to  
36 generate a baseband signal;  
37 a base station source decoder for receiving the baseband signal from the  
38 base station demodulator and performing source decoding according to a  
39 predetermined method;  
40 a base station communication controller for analyzing the mobile station's  
41 information data which is decoded and output by the base station source decoder to  
42 calculate a toll and processing data link layer control data and base station  
43 information data including destination information and billing data to form and output  
44 a predetermined base station information data frame;  
45 a base station source coder for performing source coding the base station  
46 information data frame; and  
47 a base station modulator for modulating the output data of the base station  
48 source coder according to a predetermined method and outputting modulated data  
49 to the base station interfacer.

1 15. The electronic toll collecting system of claim 14, wherein the mobile  
2 station source coder and the base station source coder perform coding according to  
3 a Manchester coding method, and the mobile station source decoder and the base  
4 station source decoder perform decoding according to a Manchester decoding  
5 method.

1 16. The electronic toll collecting system of claim 14, wherein the second  
2 carrier is provided from the base station.

1 17. The electronic toll collecting system of claim 14, wherein the first  
2 modulator performs differential phase shift keying (DPSK) modulation, the base  
3 station demodulator performs DPSK demodulation, the second modulator and the

4 base station modulator perform amplitude shift keying (ASK) modulation, and the  
5 first demodulator performs ASK demodulation.

1 18. The electronic toll collecting system of claim 14, wherein the base  
2 station demodulator comprises:

3 an amplitude limiting amplifier for receiving the output signal of the mixer and  
4 removing noise, thereby outputting a reliable signal;

5 a phase shifter for shifting the output signal of the amplitude limiting amplifier  
6 by a predetermined phase;

7 a quadrature detection receiver for receiving the output signal of the  
8 amplitude limiting amplifier and the output signal of the phase shifter, comparing the  
9 two signals to calculate the phase difference between them and filtering a signal  
10 corresponding to the calculated phase difference to output the variation of voltage;  
11 and

12 an amplitude comparator for comparing the output signal of the quadrature  
13 detection receiver with a predetermined reference value.